BREBNER FLAT
Botany report

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For:

St. Joe Ranger District

Idaho Panhandle National Forests

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Reported mileages are estimates and may vary depending on how they are rounded and what models and equations they are used for or result from.

Contents

Introduction

This report analyzes and discloses the effects of implementation of the proposed Brebner Flat project on federally listed threatened and endangered plant species and Forest Service Region 1 sensitive (TES) plant species. A summary of the findings of this analysis is included in the Affected Environment and Environmental Consequences section of the Brebner Flat Environmental Assessment (EA).

The Brebner Flat project proposes a variety of forest resource management activities on National Forest System lands within and around the Kelly Creek and Siwash Creek drainages on the St. Joe Ranger District (RD). Proposed activities include regeneration harvest and fuel reduction for 1,719 acres, along with roadwork and road/travel management changes.

No federally-listed, T&E plant species are known or suspected to occur in the project area; no suitable T&E habitat or plant occurrences were found during surveys. Consequently, the analysis below focuses on Region 1 sensitive species with the potential to occur in the project area. One Forest Service Region 1 sensitive plant occurrence was documented in the project area; it is located well away from any area of proposed activity and would be flagged for avoidance. Should any additional sensitive plant sites be found in the future and deemed necessary to ensure species and population viability and prevent a potential trend toward federal listing, those sites would be protected.

Regulatory Framework

Endangered Species Act

The purpose of the Endangered Species Act (ESA) is to provide a means whereby the ecosystems upon which threatened and endangered (T&E) species depend may be conserved and to provide for the conservation of these federally listed species. The ESA directs federal agencies to ensure that any actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of T&E species or result in the destruction or adverse modification of their critical habitats (ESA Section 7(a)(2)).

National Forest Management Act

The National Forest Management Act (NFMA) of 1976 is the primary statute governing administration of national forests and was an amendment to the Forest and Rangeland Renewable Resources Planning Act of 1974, which called for the management of renewable resources on National Forest system land. NFMA changed forest planning by requiring the Forest Service to use a systematic and interdisciplinary approach to resource management, as well as providing for public involvement in preparing and revising forest plans. This includes a requirement that project-level planning be in compliance with the National Environmental Policy Act and Land and Resource Management Plans.

Forest Service Manual

Forest Service Manual direction (FSM 2672.1 and FSM 2672.43) requires that proposed activities be reviewed for their potential effects on TES species and outlines policy, objectives, and procedures.

The Forest Service Manual (FSM 2670) (USDA Forest Service 2005) directs national forests to assist states in achieving conservation goals for endemic species, complete biological evaluations of programs and activities, avoid and minimize impacts to species with viability concerns, analyze the significance of adverse effects on populations or habitat, and coordinate with states and USFWS.

The Forest Service Manual (2670.15) defines sensitive species as those plant species identified by the Regional Forester for which population viability is a concern, as evidenced by significant current or

predicted downward trend in numbers, density, or habitat capability that would reduce a species' distribution.

FSM 2670.22 directs national forests to "maintain viable populations of all native and desired nonnative wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands." FSM 2670.32 states to "avoid or minimize impacts to species whose viability has been identified as a concern."

Land and Resource Management Plan

The Idaho Panhandle National Forests Land and Resource Management Plan (referred to as the 2015 Forest Plan) (USDA Forest Service 2015) includes the following desired condition and guideline statements for TES plants:

- FW-DC-VEG-09. (Desired Condition) Habitat for plant species listed under the Endangered Species Act (ESA) is maintained or restored on National Forest lands, thus contributing to species recovery or delisting. Ecological conditions and processes that sustain the habitats currently or potentially occupied by sensitive plant species are retained or restored. The geographic distributions of sensitive plant species in the Forest Plan area are maintained.
- FW-GDL-VEG-07. (Guideline) Evaluate proposed management activities and project areas for the presence of occupied or suitable habitat for any plant species listed under the Endangered Species Act or on the regional sensitive species list. If needed, based on pre-field review, conduct field surveys and provide mitigation or protection to maintain occurrences or habitats that are important for species sustainability.

Along with managing for TES species as outlined above, the 2015 Forest Plan, following the 2008 planning rule and directives (FSH 1909.12, Chapter 40), also identifies forest species of concern (FSOC). FSOC are species for which there is concern at the planning (e.g., forest) level, even though they are considered secure at larger scales (e.g., regional, global); they are identified based on criteria outlined in FSM 1909.12_40, 43.22b and 43.22c. The 2015 Forest Plan has no direction regarding their management, in adherence with NFMA, FSOC are targeted during surveys, documented and reported when found, and addressed in environmental documents. No determination of effects is required or made for FSOC, but effects are analyzed and described as for sensitive plants.

Methodology

The objective of this analysis is to measure the effects of the Proposed Action and No Action alternatives to Region 1 plant species with the potential to occur in the project area (see Appendix 1). Effects are evaluated based on field survey results, presence of plant occurrences and suitable habitat, and the expected responses of each species to the proposed activities. The indicators and measures described below are used to quantify the anticipated effects.

Spatial and temporal contexts for analysis

The spatial boundary for analyzing the cumulative effects to sensitive species and FSOC (collectively called rare) plants is the project area boundary, as the direct and indirect effects of proposed activities would interact with those of the past, present, and reasonably foreseeable future actions within this area.

The temporal boundaries for short-term cumulative effects range from time of implementation to five to eight years, depending on the implementation schedule for the actions; after this time, most short-term effects diminish. Long-term effects may still be apparent ten or more years following implementation.

While effects from proposed activities may still be apparent after 50+ years, generally, predicting effects to botanical resources beyond this time frame becomes too speculative to be reliable.

Indicators

The following analysis indicators are used to measure the differences between the Proposed Action and No Action alternatives:

- Number of sensitive plant occurrences affected by Proposed Action
- Number of FSOC occurrences affected by the Proposed Action
- Acres of sensitive plant habitat affected by Proposed Action
- Biological Evaluation determination category for sensitive plants

Table 1. Botany indicators and measures for assessing effects

Resource Indicator	Measure	Used to address P/N or key issue?
Sensitive plant occurrences	Number of occurrences affected	No
FSOC occurrences	Number of occurrences affected	No
Sensitive plant habitats	Acres of rare plant habitat affected (i.e., of soil disturbance and/ or changes in canopy cover)	No
Sensitive plant responses to the proposed activities	Determination category for sensitive plants	No

These indicators and measures are a useful way to assess impacts to rare plants because soil nutrient composition and structure, canopy structure and cover, and associated moisture regimes, which would be altered by the proposed activities, are key variables influencing the presence/ absence of suitable habitat for many Region 1 sensitive and FSOC species listed for the Idaho Panhandle National Forests. For instance, the maintenance of below-ground networks of soil mycorrhizae (connections between plant roots and soil fungi) are critical to plants like orchids and Moonworts (Ahlenslager and Potash 2007, Lichthardt 2003), several species of which are found on the current forest sensitive species and FSOC lists. Similarly, certain degrees of canopy cover and the ongoing input of coarse woody debris in various stages of decay (i.e., rotten logs and stumps) are necessary for the creation and maintenance of the shaded, humid conditions essential for mosses like Green bug-on-a-stick and Clear moss (Harpel and Holmberg 2005, MNHP 2017).

Degree of impact is measured as very low to high—depending on whether or not any measurable effects would take place, the scale at which impacts would occur (individual, population, or habitat-level), and whether or not these would likely affect long-term habitat capability or populations (Table 2).

Table 2. Terminology used to describe magnitude of effects

Degree of impact	Description
Very low	No measurable effect on individuals, populations, or habitat.
Low	Individuals, populations, and/ or habitat not likely affected.
Moderate	Individuals and/ or habitat may be affected, but populations would not be affected. Over the long term, habitat capability would not be reduced to below a level that could not support rare plant species.
High	Populations may be affected and/ or habitat capability would be reduced to below a level that could support rare plant species.

Determination Categories

This analysis reviews the Proposed Action and No Action alternatives in order to determine the level of effect that would occur to T&E and Region 1 sensitive plant species. One of four possible determinations is chosen based on the available literature, a thorough analysis of the potential effects of the project, and the professional judgment of the botanist who completed the evaluation.

Determination categories used for federally listed T&E species are:

- No effect
- Beneficial effect
- May affect, not likely to adversely affect
- May affect, likely to adversely affect

The four possible determinations (from FSM 2672.42) for Region 1 sensitive plants are:

- No impact
- Beneficial impact
- May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species
- Will Impact individuals or habitat with a consequence that the action may contribute to a trend toward federal listing or cause a loss of viability to the population or species

Habitat guild model

The Region 1 sensitive plant species and FSOC have been assigned to one or more habitat guilds. These are associations or groupings of plants with similar habitat requirements, specifically: wet, moist, dry, and cold forest; and subalpine, deciduous/ riparian, peatland/ meadows, and aquatic habitats (Mousseaux 1998; Appendix 3). The guilds have been described in terms of characteristics such as elevation, topographic features, overall vegetation community, etc.; they serve as useful analytical tools. Specifically, the presence/ absence of habitat guilds in a project area can be used as a proxy for the likelihood of presence of associated sensitive plant species there. A habitat type is considered as having high potential for the presence of certain associated plants, even without actual identification of plants; evaluation of potential project effects can therefore focus on likely effects to those guilds and associated rare plant species present in the project area.

Use of forest vegetation mapping data identified four habitat types as present in the project area: dry, moist, and wet forest and subalpine habitat (Timber Stand Management Records System [TSMRS]); these form the focus of this analysis.

Although this mapping is a useful ‘coarse filter’ to predict where rare plant habitat may be found, it has its limitations. For example, it is not fine-grained enough to identify specific micro-sites and variances that may also comprise important areas of rare plant habitat (e.g., seeps, springs, rock outcrops). At the same time, field surveys of areas identified as suitable by TSMRS indicate that this course filter query often overestimates the actual extent of suitable habitat.

Other information sources

Other data sources used to identify rare plant occurrences and suitable rare plant habitat included aerial photos and topographical maps, the Natural Resource Information System (NRIS) database for known rare species’ occurrence distribution on National Forest lands, queries of the forest stand and forest activities database (FACTS), Idaho Fish and Game Conservation Data Center database for element

occurrence records (ICDC 2018), National Wetlands Inventory Maps, and pertinent scientific literature (e.g., regarding target species and/ or natural histories of the area).

Data provided by these sources and the habitat guild model were used to identify areas of potential high quality habitat for sensitive plant species and FSOC within the project area and served as the basis for floristic surveys. Incomplete and unavailable information

There are limited data regarding the historical abundance and distribution of sensitive plants within the project area. This is because, prior to 1988, surveys for sensitive plants did not take place regularly and occurrence reports were sent only incidentally to the Idaho Conservation Data Center (ICDC).

Furthermore, the population ecology of many sensitive plant species remains ill-understood. For many species, scientific data identifying factors crucial to species' survival are few or lacking (Halpern and Spies 1995). In some cases, informal observations are available, but these may not be generalizable to all situations in which these plants occur. Fortunately, relevant scientific literature and monitoring reports—which provide an improved understanding of the relationship between natural and management-related habitat disturbance and the persistence of these species—exist for several of the Region 1 sensitive species, including Clustered lady's-slipper (Lichthardt 2003), Deerfern (Blake and Ebrahimi1992), Constance's bittercress and Henderson's sedge (Lichthardt 1998), Howell's gumweed (Lorain 1991), Idaho barren strawberry (Crawford 1980), and various Moonwort species (Ahlenslager and Potash 2007, Beatty et al. 2005, Evans et al. 2005).

Even with such data, however, it can be difficult to confidently quantify the effects to sensitive plant populations from disturbance events—whether natural or human-caused. Because species' ecological requirements vary, so too does their ability to inhabit or reestablish themselves in areas following disturbance. For instance, in moist or wet sites, various some Moonwort species are frequently found in younger stands (e.g., 25 years old), whereas most other moist or wet habitat species (e.g., Naked mnium moss, Green bug-on-a-stick moss, and Mountain moonwort) may require the development of old growth forest—with a specific distribution and composition of over- and understory—a process that may take more than a century following timber harvest or fuels reduction.

Affected Environment

Species and Habitat Descriptions

As directed by the Council on Environmental Quality (40 CFR 1502.2(b)), possible impacts are discussed in proportion to their significance. Table 5, below, outlines the level of analysis conducted for TES plants for this project, based on consideration of their potential to occur within the project area and the potential for direct effects from implementation of proposed Brebner Flat activities. Detailed analysis and discussion for habitat and species considered present and affected by proposed activities are found below.

Threatened and endangered plant species

U.S. Fish and Wildlife Service (USDI 2017) currently lists two plant species as threatened for the Idaho Panhandle National Forests: Water howellia (*Howellia aquatilis*) and Spalding's catchfly (*Silene spaldingii*). No species are listed as endangered for the Idaho Panhandle National Forests at this time.

Both threatened species are documented as present in Latah County and may occur on the Idaho Panhandle National Forests. Water howellia is associated with shallow, vernal freshwater pools of wetlands, edges of larger ponds, and hydrologically active or abandoned river oxbows. Spalding's catchfly occurs chiefly in dry grassland habitats and grassland inclusions in ponderosa pine and Douglas-fir forest. Field botanical surveys for these species have been conducted in potentially suitable habitat on the Idaho Panhandle National Forests; however, to date, no occurrences have been documented.

U.S. Fish and Wildlife Service (USDI 2017) currently lists Whitebark pine as a candidate for federal listing. Given this status, the regional Forester has designated Whitebark pine as a sensitive species and it is treated as such in this analysis. Whitebark pine is associated with alpine and sub-alpine habitat. Only 0.5 acres of subalpine habitat are found within the project area (along the southern boundary; see Figure 1); no activities are proposed within this habitat type.

Field botanical surveys for TES plant species were conducted in areas of proposed activities within the project area; however, no occurrences of, or suitable habitat for, either threatened species were detected. As there would be no effect to federally listed plants from activities proposed for this project, these species are not analyzed in detail in this report. There are currently no endangered plant species currently listed for the Idaho Panhandle National Forests; therefore, these are also dismissed from further analysis.

Sensitive species and FSOCs

Floristic surveys were conducted in the Brebner Flat project area in 2014–2015 and 2018; copies of botanical surveys are included in the project record. No rare plant occurrences had been documented in the project area prior to fieldwork for this project (NRIS 2018; ICDC 2018).

Figure 1 (below) shows all modelled rare plant habitat within the project area; Figure 2 shows areas of overlap between proposed treatment units and this habitat. Intensive surveys targeted high quality habitat within or adjacent to units where ground disturbance is proposed (including vegetation treatment units, roads to be decommissioned or stored, and proposed sites for road construction and reconstruction); cursory to general surveys were conducted in other units to assess the potential for rare plant occurrences and to identify any microsites that might support such species.

An inventory of all species encountered was recorded, including target sensitive species associated with habitat guilds present in the project area, FSOC, and non-native, invasive species (Appendices 1–3). Based on project surveys, a single sensitive (Mingan moonwort) and four FSOC occurrences were documented. The Mingan moonwort occurrence was found along a perennial tributary of Fishhook Creek in a forested area of Western red cedar and Doug fir and with a dense understory of Lady fern; this sensitive species occurrence would be protected from potential impacts by way of its distance from any proposed units and roadwork/ roads and a design feature requiring flagging for avoidance (Appendix 4).

At the global level, NatureServe presently ranks Mingan moonwort as a G5 species: “Secure—Common; widespread and abundant,” but because of the typically small population sizes and particular micro-site requirements, it is considered rare where it occurs. At the subnational level, in Idaho, it is ranked S3: “Vulnerable—Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation” (NatureServe 2018). To date, ninety-eight Mingan moonwort occurrences have been documented on the Idaho Panhandle National Forests, where this species is typically associated with moist and wet forest habitat and disturbance cycles of 10 to 30 years.

The four FSOC documented in the project area include one occurrence of White-flowered shooting star (global rank, G4), a species associated with wet forest habitat, and three occurrences of Round-leaved orchid (global rank, G5), a moist/ wet forest associate. Both species are currently ranked as S3 in the state of Idaho.

An extensive Round-leaved orchid occurrence was documented at the north end of the project area—associated with the Kelley Creek, Theriault Creek, and Roundhouse Gulch drainages and occurring partly in areas of modeled rare plant habitat (chiefly moist forest). The White-flowered shooting star occurrence is also found within this area, at the intersection of moist and wet forest habitat guild and within the Riparian Habitat Conservation Area (RHCA) buffer zone along the east side of Kelley Creek. The other

two Round-leaved orchid sites are scattered throughout the project area and are, for the most part, associated with moist forest habitat and/ or various drainages.

Habitat guilds and species analyzed

As noted above, sensitive plant species have been identified by the Regional Forester as species for which population viability is a concern, based on current or predicted downward trends in numbers, distribution, and/ or habitat quality. Currently, thirty-two species of sensitive plants are known or suspected to occur on the St. Joe RD of the Idaho Panhandle National Forests (USDA 2011).

As depicted in Tables 3–5 below, proposed treatment areas (units and associated roadwork) total 1,179 acres and include 760 acres of rare plant habitat (all moist forest), which comprise 17.7% of all rare plant habitat (4,295 acres total) in the project area. No vegetation treatment is proposed within dry or wet forest or subalpine habitat.

Where no effects are expected, species are not analyzed further; where effects are possible, analysis is carried forward for associated species. With respect to sensitive species, the following analysis focuses on the 15 species associated with the moist forest guild (Table 5).

Existing Condition

At present, minimal impacts to sensitive plants and FSOCs are occurring within the project area. The documented sensitive and FSOC occurrences likely represent only a subset of the actual total number of rare plants in the project area and, as such, indicate that there is currently considerable suitable rare plant habitat in this area.

Current impacts relate to road maintenance, various recreation activities, wild animals, ongoing consequences from past activities, and natural disturbances. Recreation includes activities like berry-picking, public vehicle use, hiking, camping, hunting, and firewood-cutting), which may result in some trampling and picking of individual rare plants. Wild animals are likely also trampling rare plants and some degree of herbivory and insect predation is occurring.

Natural disturbances can have impacts at the level of individual plants, as well as at the landscape or habitat level. These include events like fire and extreme weather (e.g., storms, high winds, hail, floods, landslides, and drought). Such events can cause changes in canopy cover, move soil (thereby covering or moving plants and/ or changing hydrological patterns), and introduce sudden high levels of litter (by battering the tree canopy) and new downed wood (by blowing down trees).

Additionally, past activities like road construction and timber harvest have impacted the area in ways that continue to shape the quantity and distribution of rare plant habitat—specifically, by removing vegetation and thereby altering habitat, as well as through the associated introduction of non-native, invasive plant species (weeds). Weeds are present in the project area, especially along roads, but some weed species also extend into suitable habitat from roadsides. For instance, by way of its burr-like seeds, the weed Houndstongue (*Cynoglossum officinale*) can move into the forest by adhering to animal fur. Ongoing vehicle use continues to result in the introduction of weeds (see Appendix 3 for a list of weeds classified as ‘widespread’ and ‘new’ and ‘potential invaders’ for the Idaho Panhandle National Forests). The invasive weeds are often more successful in conditions that are adverse for rare plants (e.g., areas of disturbance, times of drought) and under such circumstances, they can compete with and crowd out native plants (see Brebner Flat Weeds Report for discussion of project risks to weed introduction and spread).

Figure 1: Total rare plant habitat in the Brebner Flat project area

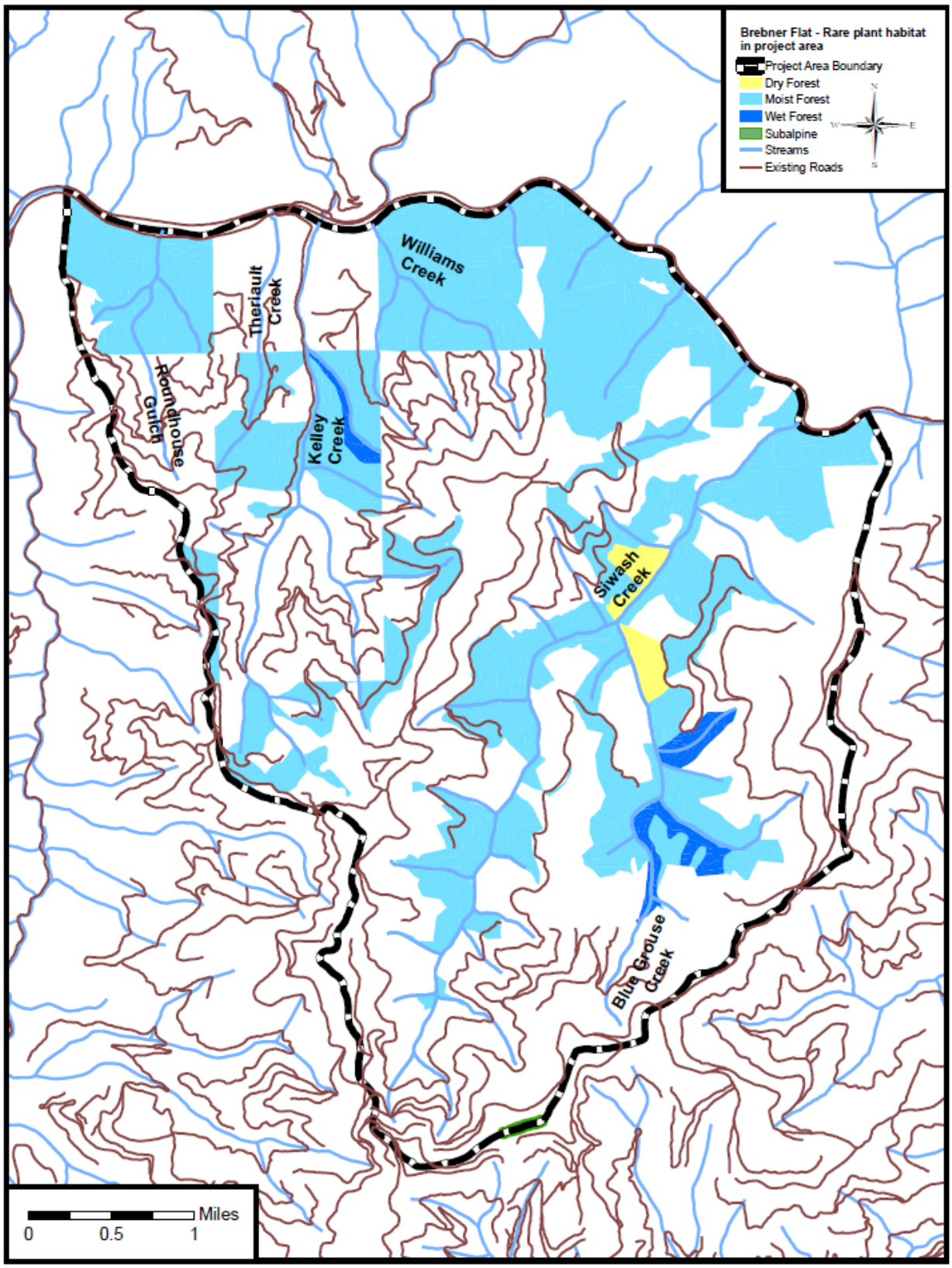

Figure 2: Proposed treatment units and affected rare plant habitat

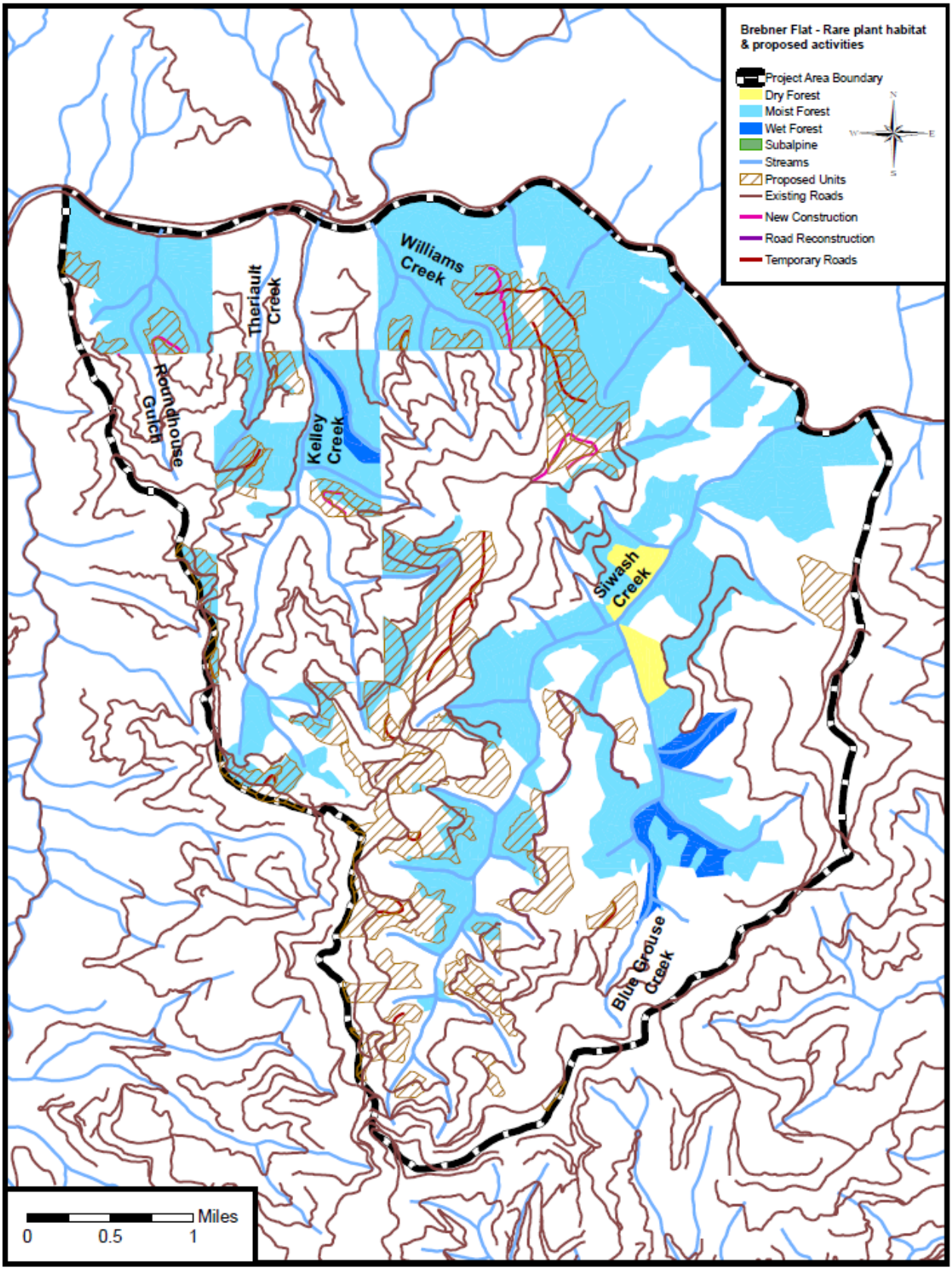

Table 3. Botany indicators and measures for the existing condition

Resource indicator	Resource measure	Existing condition	# occurrences/ acres
Sensitive plant species	# of occurrences in the project area	Mingan moonwort	1
FSOC	# of occurrences in the project area	White-flowered shooting star	1
		Round-leaved orchid	3
Sensitive plant habitat	Estimated acres in project area	Dry forest	102
		Moist forest	4,037
		Wet forest	155
		Subalpine habitat	0.5
		Total sensitive plant habitat in project area	4,295 acres
Sensitive plant habitat affected by proposed activities	Total estimated acres within proposed activity areas	Dry forest	0
		Moist forest	760
		Wet forest	0
		Subalpine habitat	0
		Total sensitive plant habitat in proposed activity areas	760 acres

Table 4. Distribution of rare plant habitat relative to proposed units

	Acres
Project area	11,779
Total proposed units	1,179
Total sensitive plant habitat in project area	4,295
Proposed areas of activity in sensitive plant habitat	760
Proposed areas of activity outside of sensitive plant habitat	959

Table 5. TES species and habitat guilds analyzed

	No detailed analysis or discussion warranted for species or habitat not present within the project area	Supporting rationale is presented in this section for those species and/ or habitat present in the project area, but not affected by the proposed activities or No Action. No detailed discussion or analysis necessary.	Species and/ or habitat considered present and potentially affected by the proposed activities or No Action are carried forward for further analysis and discussion.
Federally listed species			
Howellia aquatilis	X		
Silene spaldingii	X		
Region 1 Sensitive Species			
Aquatic guild habitat/ species	X		
Cold forest guild species	X		
Deciduous riparian guild habitat/ species	X		
Peatland guild habitat/ species	X		
Subalpine guild habitat/ species		X	
Dry forest guild habitat/ species		X	
Moist forest guild habitat/ species			X
Wet forest guild habitat/ species		X	

Existing Condition

At present, minimal impacts to sensitive plants and FSOCs are occurring within the project area. The documented sensitive and FSOC occurrences likely represent only a subset of the actual total number of rare plants in the project area and, as such, indicate that there is currently considerable suitable rare plant habitat in this area.

Current impacts relate to road maintenance, various recreation activities, wild animals, ongoing consequences from past activities, and natural disturbances. Recreation includes activities like berry-picking, public vehicle use, hiking, camping, hunting, and firewood-cutting), which may result in some trampling and picking of individual rare plants. Wild animals are likely also trampling rare plants and some degree of herbivory and insect predation is occurring.

Natural disturbances can have impacts at the level of individual plants, as well as at the landscape or habitat level. These include events like fire and extreme weather (e.g., storms, high winds, hail, floods, landslides, and drought). Such events can cause changes in canopy cover, move soil (thereby covering or moving plants and/ or changing hydrological patterns), and introduce sudden high levels of litter (by battering the tree canopy) and new downed wood (by blowing down trees).

Additionally, past activities like road construction and timber harvest have impacted the area in ways that continue to shape the quantity and distribution of rare plant habitat—specifically, by removing vegetation and thereby altering habitat, as well as through the associated introduction of non-native, invasive plant species (weeds). Weeds are present in the project area, especially along roads, but some weed species can also extend into suitable habitat from roadsides. For instance, by way of its burr-like seeds, the weed Houndstongue (*Cynoglossum officinale*) can move into the forest by adhering to animal fur. Ongoing vehicle use continues to result in the introduction of weeds (see Appendix 3 for a list of weeds classified as 'widespread' and 'new' and 'potential invaders' for the Idaho Panhandle National Forests). The invasive weeds are often more successful in conditions that are adverse for rare plants (e.g., areas of disturbance, times of drought) and under such circumstances, they can compete with and crowd out native plants (see Brebner Flat Weeds Report for discussion of project risks to weed introduction and spread).

Desired Condition

The current, 2015 Forest Plan calls for avoiding negative impacts to existing TES plants and for the maintenance of suitable habitat for these and a diversity of plant species. Specifically: "Habitat for plant species listed under the Endangered Species Act (ESA) is maintained or restored on National Forest lands, thus contributing to species recovery or delisting. Ecological conditions and processes that sustain the habitats currently or potentially occupied by sensitive plant species are retained or restored. The geographic distributions of sensitive plant species in the Forest Plan area are maintained."

Environmental consequences

No Action

The proposed harvest treatments or associated activities would not occur in the case of the No Action alternative. Ongoing and future authorized management activities would continue as planned.

Direct and indirect effects

Because none of the proposed activities would take place, the No Action alternative would have no direct impacts on rare plants or their habitat.

Likely indirect effects of the No Action alternative to rare plant habitat and populations would include risks associated with gradual increases in fuel loads over time as a result of fire suppression. In this case, if a wildlife started in the project area, fuels accumulations could result in a high intensity fire and the consequent loss of rare plants and suitable habitat. The magnitude of effects to rare plants from a wildfire under these circumstances would vary depending on factors like the intensity of the fire, species' ability to survive the event, and their ability to persist until shade-moisture conditions are restored to a degree that is favorable for them.

Continued fire suppression and the consequent increased canopy cover and more densely stocked forests associated with the No Action alternative may also have the indirect effect of reducing suitable habitat for some sensitive species over time. For instance, historical 10 to 30-year cycles of fire created the forest structure and composition comprising suitable habitat for all but one of the eleven rare Moonworts listed for the Idaho Panhandle National Forests (Mountain moonwort is associated with mature/ old growth western redcedar). Periodic disturbance is necessary for the maintenance of these species' habitat—i.e., to maintain certain species composition and degrees/ type of canopy cover (Ahlenslager and Potash 2007, Fulkerson et al. 2017; Zika et al. 1995). Similarly, in the case of fire exclusion, Whitebark pine, an early seral species, will be replaced by shade-tolerant species (sub-alpine fir, spruce, mountain hemlock) (USDA FS RMRS-GTR 2012).

Proposed Action

The Brebner Flat Environmental Assessment explains the purpose and need for the project and the specific activities proposed. The project includes commercial timber harvest and roadwork to provide access to project areas (Table 6 below).

Table 6. Summary of Brebner Flat proposed activities

Activity	Type	Quantity
Logging systems (1,719 acres total)	Ground-based	583 acres
	Skyline	897 acres
	Off-road Skyline	239 acres
Silvicultural treatments (1,719 acres total)	Clearcut Harvest with reserves	617 acres
	Seed Tree with reserves	273 acres
	Irregular Shelterwood/Seed Tree with reserves	260 acres
	Irregular Shelterwood with reserves	569 acres
Road management	New construction	2.04 miles
	Temporary road construction	4.0 miles
	Road reconstruction	3 miles
	Road maintenance	47.8 miles
	Non-system road to be added to National Forest System	1.7 miles
	Non-system road decommissioning	1.3 miles
	Road storage	10.3

Project design features

1. Provisions for the protection of Endangered Species and settlement for environmental cancellation would be included in all contracts as specified under Timber Sale Contract provisions B6.24, Protection Measures Needed for Plants, Animals, Cultural Resources, and Cave Resources; C6.24#- Site Specific Special Protection Measures; and B8.33, Contract Suspension and Modification.

2. The single documented sensitive plant occurrence is located more than 100 feet from any proposed activities. As an additional protective measure, it will be buffered and flagged for visibility (see Appendix 4 for specific information location).

3. For any additional sensitive plant occurrences identified during project implementation, an agency botanist would be contacted and an assessment conducted in order to determine appropriate management prescriptions. These might include:

    - Modifying activity methods to protect rare plants and their habitats or otherwise modifying the proposed activity, and/ or

    - Implementing spatial buffers around plant occurrences.

4. Monitoring of one documented FSOC, Round-leaved orchid occurrence, is proposed in order to contribute data regarding this species' response to the indirect habitat changes caused by soil disturbance and changes in canopy cover associated with the Proposed Action. The location

information for the occurrence is found in Appendix 4. The timeframe and specific objectives of the monitoring are outlined in the discussion of indirect effects from the Proposed Action, below.

Direct and indirect effects

As discussed previously, the project area includes approximately 4,295 acres suitable habitat for rare plants. In addition to the acres indicated by the rare plant habitat guild model (Tables 3–4), the documentation of one sensitive and four FSOC plant occurrences during the 2014–2015/ 2018 surveys confirms the suitability of portions of the area for such species.

Table 6 outlines the specific activities proposed in the Brebner Flat project area; the type and magnitude of potential direct and indirect impacts associated with these activities are described below. As discussed, of the 1,719 acres proposed for timber harvest, 760 acres are considered rare plant habitat. These 760 acres represent 17.7% of the total (4,295) acres of rare plant habitat in the project area. Consequently, under the Proposed Action, 82.3% of the rare plant habitat would remain under existing conditions): potential impacts would be limited to 17.7% of all rare plant habitat in the project area (the area of analysis).

Direct effects

No known locations of sensitive plants occur within 100 feet of units or roadways in the proposed project area. Site-specific design features for the single documented sensitive Moonwort occurrence and any additional occurrences identified during implementation are outlined above and in Appendix 4.

Undetected rare plant occurrences may be directly impacted: they could be directly crushed or killed by soil and vegetation removal, timber removal equipment and personnel, and disturbances associated with the various types of roadwork. Additionally, undetected annual plants that experience disturbance prior to seed set may experience subsequent decreased viability as a consequence of a reduced seed bank. Perennial plants may experience ground disturbance to rootstocks (rhizomes, taproots, and bulbs), potentially inhibiting the plants' ability to re-sprout from rootstock.

Although the FSOC are not managed (i.e., protected), the single White-flowered shooting star occurrence would be secure, as it is located within the protected riparian corridor and well away from any possible impacts from proposed activities. Portions of the three Round-leaved orchid occurrences are located near to or within units. Consequently, some individual plants from each occurrence would be directly affected by the proposed activities, but most would be away from potential direct impacts.

In their technical reports about this species (focused chiefly on data from Wyoming/ South Dakota and Oregon, respectively), Hornbeck et al. (2003) and Lesher and Anderson (1998) recommend monitoring for the Round-leaved orchid, observing that such information is currently lacking for this species. Moreover, at present, there are no data specific to this species for the Idaho Panhandle National Forests or northern Idaho/ western Montana. The proposed monitoring would begin to address this gap in data.

Monitoring would focus on clusters (sub-occurrences) of Round-leaved orchid plants belonging to the most extensive occurrence in the project area, which spans various drainages from Roundhouse Gulch to Kelley Creek. Three sub-occurrences would be monitored: two sites in proposed units and one reference site that would not undergo treatment. The monitoring would record data relating to canopy cover and forest floor cover; it would begin prior to project implementation and would be conducted for a period of ten years in order to capture data following the dissipation of short-term effects.

Indirect effects

Indirect effects include changes to rare plant habitat as a result of canopy removal and soil disturbance. The consequences of these changes for rare plants (specifically, to their ability to persist on the landscape)

will vary depending on the extent, intensity, and frequency of the disturbance (e.g.,) on the one hand, and on species' inherent tolerance to (or need for) disturbance, on the other.

Species' disturbance tolerance

Appendices 5 and 6 summarize available data regarding habitat requirements and disturbance tolerance for the 15 moist habitat sensitive species and the two FSOC documented in the project area. Based on these data, it appears that the sensitive species can be broken into three groups: 1) seven species for which some level of disturbance can be beneficial (contingent on scale, intensity, and frequency); 2) six species for which disturbance is not beneficial; and 3) two species for which there is information indicating that some degree of disturbance may be beneficial, but for which conflicting data also exist and/ or data are too few/ preliminary. In the case of the two FSOC documented in the project area, current data indicate that they fall into group 2: disturbance from logging is likely not beneficial.

Physical disruption of the understory community resulting from the Proposed Action may eliminate those species from the stand that are disturbance intolerant, especially taxa with low resilience to logging-related disturbance. Ultimately, frequent and intense disturbances may favor species tolerant of disturbance (including weed species) and result in a decrease in species with low dispersal rates (Halpern and Spies 1995).

For moist forest habitat, disturbance-intolerant sensitive species include: Maidenhair spleenwort, Green bug-on-a-stick, Clustered lady's slipper, Britton's grimmia moss, Chickweed monkeyflower, and Naked mnium moss. These species are associated with shaded, humid, mature/ old growth forested areas with continued input of decaying wood—as well as with micro-sites like rock cliffs and outcrops or seeps within moist and wet forest habitat. On the other hand, other moist forest sensitive species may benefit from the proposed shift in forest composition and structure toward the desired condition, as periodic disturbance provides for the maintenance of important components of their habitat. Deer fern and six of the sensitive Moonwort species fall into this category. Two other moist forest species, Constance's bittercress and Idaho barren strawberry, may benefit from some level of disturbance; however, further data are necessary in order to clarify the degree and type(s) of disturbance that can be beneficial—as well as clarifying the interrelationship of disturbance with other factors in determining these species' success (Lichthardt and Mosely 1994: 21).

With respect to the FSOC Round-leaved orchid, existing data indicate that this species may benefit in the long-term from the impacts to forest succession and canopy cover resulting from fire; however, based on habitat associations for studied populations, Hornbeck et al. (2003) and Lesher and Anderson (1988) surmise that vegetation management activities such as logging would remove important micro- and macro-habitat requirements (which include damp, humus soils and shaded, mature stands) and would thus adversely affect this species indirectly. Similarly, the FSOC, White-flowered shooting star, is associated with wet forest habitat, requiring shaded, humid conditions, and is therefore unlikely to tolerate disturbance.

Canopy removal and soil disturbance associated with the Proposed Action

Logging and new/temporary road construction (and, to a lesser degree, some other types of roadwork) involve canopy removal. Canopy removal results in decreased shade and site humidity, setting the stage for changes in plant community composition. In northern Idaho, pioneer species tolerant of sunnier, hotter, and more arid conditions and disturbed soils include some native plants, but mainly non-native, invasive weed species, which can out-compete native plants under the altered light/moisture regime (see Brebner Flat Weeds Report). Moreover, many of the Region 1 moist forest sensitive and FSOC plants require shadier, cooler, and more humid conditions, meaning that they are indirectly adversely affected by the altered habitat.

Soil disturbance also impacts habitat conditions. For instance, it disrupts the soil mycorrhizae critical to orchids and Moonworts and, through the removal of large quantities of vegetation and soil compaction, changes soil hydrology. Pioneer plant species (native and non-native) thrive in disturbed soils, giving them a competitive advantage over later seral species, which includes many moist habitat rare plants. Furthermore, as discussed, non-native weed species have been inadvertently introduced to National Forest lands in the past as 'hitchhikers' adhering to, for example, machinery (e.g., used in logging and roadwork) and vehicles. Design features requiring the effective cleaning of all machinery and equipment used in the proposed project are described in the Brebner Flat Weeds Report and EA; such measures would mitigate, but not eliminate, the introduction and spread of weeds to the project area.

Soil compaction would occur as a result of the Proposed Action along all types of roads, skid trails, and other areas where machinery is driven and/ or stationed). Soil compaction can alter current and future success of certain understory plants due to mortality, reduction in future recruitment, changed soil moisture, and lost or disrupted mycorrhizal connections. Design features of the Proposed Action related to soils would minimize soil displacement and compaction (Brebner Flat Soils Report). Some sensitive species, including six of the moist forest sensitive Moonworts, are not negatively impacted by soil compaction. Rather, these Moonwort species occur in compacted soils associated with "parking lots, picnic and camping areas, road sides (in cracks and gravel in asphalt)," leading Donald Farrar of Iowa State University, a specialist in moonworts, to conclude that, "Soil compaction is often listed as a threat, but I don't think that it really is a problem" (Farrar 2006, cited in Ahlenslager and Potash 2007: 38).

Proposed silvicultural treatments and yarding systems

The intensity of impacts to the 760 acres of rare plant habitat would depend on the specific activity proposed, as some silvicultural treatments, yarding methods, and types of roadwork are more or less detrimental than others. For example, skyline yarding is less harmful to rare plant habitat than ground-based yarding; use of this method for 66% of the harvest would therefore lessen the overall magnitude of impacts from the project (as opposed to a project using only ground-based yarding). Similarly, the relative impacts of the different silvicultural methods proposed are, from most to least severe: clearcutting with reserves (617 acres or 35% of proposed treatment), seed tree (273 acres, 16%), and the various types of shelterwood treatment (829 acres, 48%); see the Brebner Flat EA for a detailed discussion about the rationale for the different types of proposed treatment.

Proposed roadwork

Table 6 outlines the roadwork proposed to provide access to timber harvest units. As discussed above, indirect effects to rare plant habitat from roadwork include canopy removal, soil disturbance, soil compaction, and the introduction/spread of invasive weed species.

Appendix 7 details the effects associated with the different types of proposed roadwork. The 2.04 miles of new road would represent a permanent loss of habitat for native plants, whereas the impacts of the 4 miles of temporary road would be shorter-lived. In the long term, the proposed 1.3 miles of non-system road decommissioning and 10.3 miles of long-term storage would permit these areas to return to native vegetation.

With respect to time frame, indirect impacts to habitat would be most acute 10–30 years following project implementation—until the regenerating tree canopy begins to provide shade and other associated conditions necessary favoring rare plant species' return. Weeds introduced through project-related activities may persist after road closure, storage, and decommissioning, so that indirect impacts related to changes in plant community composition last longer than the life of these roads. Other elements of rare plant habitat may not return for over 50 years—for instance, conditions associated with mature forest stands.

Cumulative effects

Past, present, and reasonably foreseeable future actions

Reasonably foreseeable and ongoing activities on National Forest System lands within the area of analysis for cumulative effects would have low impacts to rare plants overall (see Appendix 7 for a detailed discussion). Rare plant habitat assessment is conducted for all ground and/ or vegetation disturbance on the St. Joe RD and, although some individual sensitive plants may occasionally be impacted, cumulative impacts to these species and their habitat are expected to be low. Specifically, activities such as timber harvesting, Travel Plan implementation, St. Joe RD weed herbicide treatment, roadwork, and outfitter guide and recreation activities have all been evaluated by way of the National Environmental Policy Act (NEPA) process.

Past activities in the project area include road construction, reconstruction, decommissioning, and maintenance; vegetation management including timber harvest, pre-commercial thinning, tree planting, and prescribed burns; vehicular traffic; and recreational uses. Together, these activities have, to some extent, decreased the overall extent of suitable sensitive plant habitat present in the project area and resulted in the disturbance and/or mortality of individual sensitive plants. Specifically, in various ways already discussed, these activities have resulted in habitat alteration and fragmentation in and around the project area. The effects from these disturbances may have reduced the number of sensitive plant occurrences or acres of suitable habitats within the project area, although it is difficult to track and/ or quantify such loss. At the same time, activities like road decommissioning and tree planting may have accelerated the recovery of some areas toward suitable habitat conditions. Similar to the current proposal, past activities have included design features to help protect and/or mitigate impacts to rare plants.

A total of 2,959 acres of private land is located in the 11,779 acre Brebner Flat project area. The Forest Service has no influence over activities taking place on private land. Additionally, no rare plant data are available for the private land—i.e., concerning species present and their numbers, distribution, and condition. Because of this, it is not possible to know the degree to which past activities have affected populations on these lands or on nearby/adjacent National Forest System lands. However, based on a 15-year summary of activities on the 2,959 acres of private land in the Brebner Flat project area, it is possible to make some general observations regarding likely impacts.

From 2003 to 2018, 38% of the private land in the project area (1,128 acres) was harvested (1,030 acres overstory removal and 98 acres clearcut) (IDL 2018). Because there are no policies in place affording protection to sensitive species on private land, the types of direct and indirect impacts of these activities (the same as described above for project-related activities), would be likely detrimental to rare plants.

Additionally, one way that this timber harvest on private land within the project area may affect rare plant populations and their habitat on adjacent/nearby National Forest System land has to do with the effect of forest edges on microclimatic conditions. Compared to interior forest, forest edges are characterized by increased solar radiation and wind, which cause increased air and soil temperatures and decreased humidity and soil moisture (e.g., Chen et al. 1995). 'Edge effect' varies, depending on several variables, and can be measured in terms of significance (intensity of changes in temperature, wind, and moisture) and depth of effects (distance from edge into interior forest) (Chen et al. 1995: 74). In addition to the changed microclimatic conditions, edge effect has also been seen to alter animal-plant interactions in ways that can negatively affect plant populations' persistence on the landscape. For instance, Jules and Rathcke (1998) found a correlation between reduced recruitment of *Trillium*, a long-lived herbaceous perennial, and proximity to forest edge. They identified two mechanisms for this trend: 1) decreased seed production because of changes in pollination dynamics (reduced visits from pollinators) and 2) increased seed predation by rodents, which were found to be present in much greater numbers in clearcut areas (e.g., Mills 1996).

In summary, although it is not possible to determine the exact effects of activities on private lands on National Forest System rare plant populations, some level of adverse historic, current, and future impacts to sensitive species and FSOC is likely.

Determination of cumulative effects

Because no suitable habitats for the two threatened species listed for the Idaho Panhandle National Forests, Water howellia and Spalding's catchfly, the Proposed Action would have **no effect** to these species. There would be **no effect** to endangered species, as currently none are listed for the Idaho Panhandle National Forests.

Region 1 sensitive plants that occur only in cold forest, dry forest, wet forest, deciduous/riparian, peatland/meadows, and/ or aquatic habitat guilds would not be affected by the Proposed Action because these habitats are not present in areas affected by the proposed activities. Therefore, it is my determination that the Proposed Action would have **no impact** to the 19 sensitive species associated with these guilds.

Protective project- and site-level design features would ensure that no impacts occur to the single known sensitive plant occurrence or any additional sensitive plant occurrences encountered during implementation of the Proposed Action. It is possible, however, that undetected occurrences would be directly affected. Of the total 4,295 acres of rare plant habitat in the project area, habitat conditions for 760 acres (17.7%) would be indirectly impacted by the proposed activities: 82.3% would remain unaffected, under existing conditions.

In the long term, species whose habitat developed based on shorter cycles of disturbance may benefit in treated areas. Specifically, the proposed activities may enhance and increase available suitable habitat by changing the present condition to a more desirable condition (i.e., trending forest composition, structure, and patterning for the warm/moist biophysical setting toward the desired condition, FW-DC-VEG-11).

Overall, the Proposed Action would have low short-term impacts and possible beneficial long-term impacts to some sensitive plant species/habitat associated with the moist forest guild. It is my determination that while the Proposed Action **may impact some individual plants and habitat in the short-term, it will not likely lead to a trend towards federal listing or cause a loss of viability to the population of the 15 moist forest habitat sensitive species** analyzed here (Appendix 5).

Summary of environmental effects

Table 7 provides a summary comparison of the environmental effects of the No Action and Proposed Action alternatives to sensitive plants and their habitat.

Table 7. Summary comparison of environmental effects to sensitive plants

Resource Indicator	Measure	No-Action	Proposed Action
Sensitive plant occurrences	Number of occurrences affected	0	0 (implementation of site-specific design features to protect documented occurrences from direct impacts, where applicable)
FSOC occurrences	Number of occurrences affected	3	Portions of 3 occurrences would be impacted
Sensitive plant habitat	Total acres impacted	0 acres directly impacted; possible indirect impacts to 760 acres as result of continued fire suppression and forest succession & increased risk of wildfire	Low adverse short-term impacts to 760 acres due to proposed activities; potential long-term benefits to 760 acres (17.7% of total rare plant habitat in project area)
Sensitive plants response to proposed activities	Determination category	NA	For 15 sensitive species associated with dry, moist, & wet forest habitat: **May impact individuals or habitat** but will not likely contribute to a trend towards Federal listing or cause loss of viability to the population or species For 19 sensitive species not associated the above habitat types: **No impact**

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Appendices

Appendix 1: 2011 Regional forester's sensitive species and FSOC lists for the Idaho Panhandle National Forests, St. Joe RD

	Status and Species	Common Name	Habitat Guild
		Threatened	
1	*Howellia aquatilis*	Water howellia	Aquatic
2	*Silene spaldingii*	Spalding's catchfly	Dry grasslands, grasslands within dry forest
		Sensitive	
3	*Asplenium trichomanes*	Maidenhair spleenwort	Rock seeps in Moist/Wet Forest
4	*Blechnum spicant*	Deerfern	Moist/Wet Forest
5	*Botrychium ascendens*	Upswept moonwort	Wet Forest
6	*Botrychium crenulatum*	Dainty moonwort	Wet Forest
7	*Botrychium lanceolatum*	Triangle moonwort	Wet Forest/Moist Forest
8	*Botrychium lineare* (H)	Slender moonwort	Moist Forest
9	*Botrychium minganense*	Mingan moonwort	Wet Forest/Moist Forest
10	*Botrychium montanum*	Western goblin	Wet Forest
11	*Botrychium paradoxum*	Paradox moonwort	Wet Forest/Moist Forest
12	*Botrychium pedunculosum*	Stalked moonwort	Wet Forest
13	*Botrychium pinnatum*	Northwestern moonwort	Wet Forest/Moist Forest
14	*Botrychium simplex*	Least moonwort	Wet Forest/Moist Forest
15	*Buxbaumia aphylla* (S)	Leafless bug-on-a-stick moss	Subalpine
16	*Buxbaumia viridis*	Green bug-on-a-stick moss	Wet Forest/Moist Forest
17	*Cardamine constancei*	Constance's bittercress	Deciduous Riparian/Moist/Wet Forest
18	*Carex chordorrhiza*	String-root sedge	Peatland (Coeur d'Alene only)
19	*Carex livida*	Pale sedge	Peatland (Coeur d'Alene only)
20	*Cypripedium fasciculatum*	Clustered lady's slipper	Moist/Wet/Dry Forest
21	*Cypripedium parviflorum var. pubescens*	Greater yellow lady's slipper	Wet Forest/Wet meadows/ peatlands
22	*Grindelia howellii*	Howell's gumweed	Dry Forest (St. Joe , basalt breaklands)
23	*Grimmia brittoniae*	Britton's Grimmia moss	Rock outcrops in Moist Forest

24	*Hookeria lucens* (H)	Clear moss	Wet Forest
25	*Hypericum majus*	Large Canadian St. Johnswort	Peatland (Coeur d'Alene)
26	*Mimulus alsinoides*	Chickweed monkeyflower	Rock cliffs/ seeps in Wet/Moist/Dry Forest
27	*Pinus albicaulis*	Whitebark pine	Alpine/ subalpine
28	*Rhynchospora alba*	White beakrush	Peatlands (Coeur d'Alene)
29	*Rhizomnium nudum*	Naked Mnium	Wet/Moist Forest
30	*Scheuchzeria palustris*	Pod grass	Peatlands (Coeur d'Alene)
31	*Schoenoplectus subterminalis*	Water clubrush	Peatlands (Coeur d'Alene)
32	*Thelypteris nevadensis* (S)	Sierra woodfern	Wet Forest seeps
33	*Triantha occidentalis* spp. *brevistyla*	Sticky asphodel	Subalpine Peatlands (St. Joe ?)
34	*Waldsteinia idahoensis*	Idaho barren strawberry	Moist and Wet Forest

* based on Regional Forester's TES list, (S) = suspected to occur on the Idaho Panhandle National Forests, (H) = historical occurrence on the Idaho Panhandle National Forests

Coeur d'Alene River and St. Joe Ranger District Forest Species of Concern, May 2011*

Species	Common Name	Habitat Guild
Astragalus bourgovii	Bourgeau's milkvetch	Subalpine
Botrychium michiganense (s)	Michigan moonwort	Moist Forest
Calochortus nitidus (s)	Broadfruit mariposa lily	Dry Forest, Palouse Soils (St. Joe, St. Maries)
Carex californica	California sedge	Subalpine
Carex hendersonii	Henderson's sedge	Moist/Wet Forest
Cetraria sepincola	eyed ruffle lichen	Deciduous Riparian, Peatland
Cladonia bellidiflora (s)	Toy soldiers	Moist Forest
Cladonia transcendens (s)	transcending reindeer lichen	Wet Forest
Collema curtisporum	Short-spored jelly lichen	Deciduous riparian
Corydalis caseana spp. hastata (s)	Case's fitweed	Wet Forest (St. Maries, North Fk Clearwater)
Dodecatheon dentatum	White-flowered shooting star	Wet Forest
Cephalanthera austiniae	Phantom orchid	Moist/Wet Forest
Lobaria hallii	Hall's lungwort	Deciduous Riparian
Lobaria scrobiculata (s)	Textured lungwort	Deciduous Riparian
Ludwigia polycarpa	Manyfruit primrose willow (false-loosestrife)	Peatland/aquatic
Mimulus clivicola	Bank monkeyflower	Dry Forests
Romanzoffia sitchensis	Sitka mistmaiden	Subalpine
Orobanche pinorum	Pine broomrape	Dry Forest
Platanthera orbiculata	Round-leaved orchid	Moist/Wet Forest
Pilophorus acicularis (on pvt land)	Devil's matchstick lichen	Wet Forests
Ribes sanguineum (s)	Red-flowered currant	Moist forest
Sedum rupicolum(s)	Lance-leaved sedum	Subalpine
Sphaerophorus globosus	Christmas tree lichen	Wet Forest
Tauschia tenuissima (s)	Lieberg's tauschia	Dry/Moist Forest, meadows
Thamnolia subuliformis	Worm lichen	Subalpine
Trientalis latifolia	Western starflower	Deciduous Riparian/Moist/Wet Forest
Vallisneria americana	Wild celery	Aquatic

(s) = suspected to occur on the Coeur d'Alene River Ranger District

* As directed by the Species of Concern Protocol (Region One Planning Peer Group, Task Group 19, March 1997), species of concern are considered to be secure at the global, Regional and state levels, but may be at risk at the Forest planning level.

Species on this list will be surveyed for, documented and reported when found, and addressed in environmental documents (per NFMA) when viability within the planning unit is an issue.

Appendix 2: Mousseaux's (1998) St. Joe and Coeur d'Alene Rare Plant Guild Descriptions: Based on October 2004 Regional Forester's Species at Risk list[1]

Subalpine Plant Guild: Includes certain plant communities found at high elevation sites, generally above ca 5,000 feet, mostly on ridges, subalpine balds and parklands (subalpine grass and sedge communities), exposed rock-outcrops and the following high elevation communities: *Abies bifolia* (subalpine fir) krummholtz, *Abies bifolia / Rhododendron albiflorum* (subalpine fir/white rhododendron), *Salix commutata* (undergreen willow), *Abies bifolia / Vaccinium scoparium* (subalpine fir/grouse whortleberry), *Abies bifolia / Luzula hitchcockii* (subalpine fir/smooth woodrush), and *Larix lyallii* (subalpine larch) / *Pinus albicaulis* (whitebark pine) plant communities. It also includes the cool/moist and cool/dry phases of *Abies bifolia* / *Menziesia ferruginea* (subalpine fir / menziesia), *Abies bifolia / Xerophyllum tenax* (subalpine fir / beargrass), *Tsuga mertensiana / Menziesia ferruginea* (mt. hemlock / menziesia) and *Tsuga mertensiana / Xerophyllum tenax* (Mt. hemlock / beargrass) plant communities. The rare species found in this guild include *Buxbaumia aphylla* (bug-on-a-stick moss), and *Cetraria subalpina* (Iceland-moss lichen), a Forest Species of Concern (FSOC), that is associated with menziesia in cold subalpine fir sites. *Pinus albicaulis* (Whitebark pine) occupies exposed ridges on harsh sites, generally above 5,000 feet.

Wet Forest Guild: This guild is found in wet, generally riparian, often (not always) middle to late successional western redcedar and wet western hemlock plant communities, including most identified 'ancient cedar groves' found scattered throughout the northern sub-basins, generally less than 4,000 feet. Certain plant communities within these systems have a high potential to support rare plants, including *Thuja plicata / Oplopanax horridum* (cedar/devil's club), *Thuja plicata* / *Athyrium filix-femina* (cedar/ladyfern), *Thuja plicata* / *Adiantum aleuticum* (cedar/maidenhair fern), *Tsuga heterophylla* / *Gymnocarpium dryopteris* (western hemlock/oakfern) and *Thuja plicata* / *Gymnocarpium dryopteris* (cedar/oakfern) plant communities. Several species within this guild are rare coastal disjuncts such as *Blechnum spicant* (deerfern), *Thelypteris nevadensis (*sierra woodfern*), Hookeria lucens* (clear moss) and *Carex hendersonii (*Henderson's sedge). Sierra woodfern and clear moss are associated with seeps and "boggy" areas in wet cedar forests. Certain endemic or scattered rare species like the rare *Botrychium* spp. (moonworts), especially *Botrychium montanum* (western goblin), *Botrychium minganense* (Mingan moonwort), *Botrychium pedunculosum* (stalked moonwort), *Botrychium paradoxum* (paradox moonwort), and *Botrychium ascendens* (upswept moonwort), can be found in these communities on riparian benches or other shallow sloped microsites. The scattered species *Cypripedium fasciculatum* (clustered lady's slipper), Cypripedium parviflorum var. pubescens (greater yellow lady's slipper), and the Idaho endemics *Cardamine constancei* (Constance's bittercress) and *Waldsteinia idahoensis* (Idaho Barren strawberry) can occur in wet forest communities. *Asplenium trichomanes* (maidenhair spleenwort) and *Mimulus alsinoides* (chickweed monkey-flower) can also be found in seasonally wet rock seeps, and *Buxbaumia viridis* (green bug-on-a-stick moss), a Forest Species of Concern (FSOC), can

[1] There have been changes in status for some species discussed here—e.g., *Spiranthes diluvialis* (Deciduous Riparian guild) is no longer a federally listed, threatened species). See Appendix 2 for the current list of TES species.

be found on decomposing cedar logs in wet forest habitat. Many of the Wet Forest Guild species can also be found in upslope, Moist forest guild habitats.

Moist Forest Guild: This guild is found in moist *Thuja plicata* (western redcedar) and *Tsuga heterophylla* (western hemlock) plant communities, generally in later successional states below 4,500 feet. A few species can also be found in moist *Abies grandis / Asarum caudatum* (grand fir / ginger) and *Abies grandis / Clintonia uniflora* (Grand fir / queencup beadlily) communities. Many members of the Wet Forest Guild can be found in these more mesic upland plant communities. This guild contains the following plant associations: *Tsuga heterophylla* / *Asarum caudatum* (hemlock/wild ginger), *T. heterophylla / A. caudatum - Aralia nudicaulis* (hemlock/ginger - wild sarsaparilla), *T. heterophylla / Clintonia uniflora* (hemlock / beadlily), *T. heterophylla / C. uniflora / Aralia nudicaulis* (hemlock / beadlily - wild sarsaparilla), *T. heterophylla / C. uniflora / Menziesia ferruginea* (hemlock / beadlily - fool's huckleberry), *Thuja plicata / Asarum caudatum* (cedar/ginger) and *Thuja plicata / Clintonia uniflora* (cedar/beadlily). Some of the rare species found in these communities occur in small moist microsites, like *Asplenium trichomanes* (maidenhair spleenwort) and *Mimulus alsinoides* (chickweed monkey-flower), which are found on seepy rock outcrops. Rare plant species such as the coastal disjuncts *Blechnum spicant* (deerfern) and *Carex hendersonii (*Henderson's sedge) are found in moist forest habitats. Certain regional endemic or scattered rare species like the *Botrychium* spp. (moonworts), especially *Botrychium minganense* (Mingan moonwort), *Botrychium lanceolatum* (triangle moonwort) and *Botrychium pinnatum* (northwestern moonwort) can be found in shallow sloped microsites, and *Cypripedium fasciculatum* (clustered lady's slipper) and the Idaho endemic *Cardamine constancei* (Constance's bittercress) occur in these communities. *Waldsteinia idahoensis* (Idaho barren strawberry), an Idaho endemic, has also been found in *Abies grandis / Clintonia uniflora* (grand fir / beadlily) communities on the breaklands of the Coeur d'Alene River.

Dry Forest Guild: This guild encompasses dry, open sites in *Pinus ponderosa* (ponderosa pine), *Pseudotsuga menziesii / Physocarpus malvaceus* (Douglas-fir / ninebark), *P. menziesii / Calamagrostis rubescens* / *Arctostaphylos uva-ursi* (Douglas-fir / pinegrass - kinnikinnick), *P. menziesii / Festuca idahoensis* (Douglas-fir / Idaho fescue) or *Agropyron spicatum* [*Elymus spicatus*] (bluebunch wheatgrass) communities, generally less than 4500 feet. The Idaho endemic, *Grindelia howellii* (Howell's gumweed) can be found in these dry communities on the St. Joe associated with basalt breaklands. Dry Douglas-fir and grand fir communities, *P. menziesia* / *Physocarpus malvaceus* (Douglas-fir / ninebark) ,and *Abies grandis / Physocarpus malvaceus* (grand fir / nine bark) also support populations of *Cypripedium fasciculatum* (clustered lady's slipper) on the Coeur d'Alene and St. Joe National Forests. *Orobanche pinorum* (pine broomrape) is found in association with *Holodiscus discolor* (oceanspray) in dry forests of Douglas fir and grand fir. *Mimulus alsinoides* (chickweed monkey-flower) can occur on seasonally seepy rock outcrops and moss mats in otherwise dry communities.

Deciduous Riparian Guild (broad-leaved deciduous) forests occur on islands and margins of lowland major rivers such as the lower Coeur d'Alene River, lower St. Joe River, and the St. Maries River. These forests are most commonly dominated by the cottonwood *Populus trichocarpa* (black cottonwood), with lesser amounts of introduced *P. deltoides* (plains cottonwood) and hybrid poplars (*Populus trichocarpa* X ?) planted for streambank stability. Cottonwood communities often are adjacent to shrub-carr communities and can form an indistinguishable mosaic. These communities provide the only high potential habitat for the listed threatened species *Spiranthes diluvialis* (Ute ladies'-tresses), which is suspected to occur here. *Collema curtisporum* (short-spored jelly lichen), is a globally

rare lichen found on large diameter (old) black cottonwood. The rare Idaho endemic *Cardamine constancei* (Constance's bittercress) can be found in the transition zone between cottonwood and western redcedar communities on the Coeur d'Alene and St. Joe Rivers. Stands of *P. tremuloides* (quaking aspen) are also present and associated with higher gradient streams or moist seeps. *Populus tremuloides* (quaking aspen), *Betula papyrifera* (paper birch) and *Betula occidentalis* (water birch) also occur as secondary components in lowland conifer dominated forests throughout northern Idaho. *Alnus rubra* (red alder), is an uncommon, but sometimes locally abundant, coastal disjunct, and can be a codominant in moist forests in lower elevation riparian zones along Coeur d'Alene Lake, the lower St. Joe and the lower St. Joe River. It is also found in patches in drainages in the Little North Fork of the Clearwater River on the Idaho Panhandle National Forests. Channel bars along major rivers are frequently vegetated with *Salix exigua* (coyote willow) and young *Populus trichocarpa* (black cottonwood) seedlings.

Aquatic Guild: This guild occurs generally in littoral (< 2 meters) zones of vernal pools, small ponds and lakes throughout northern Idaho, generally at lower elevations. *Potamogeton natans* (floating-leaved pondweed), *Myriophyllum* spp. (water-milfoil), *Utricularia* spp. (bladderwort), and other *Potamogeton* spp. occur alone or in combination in shallow littoral zones. *Nuphar polysepalum* (yellow pond lily) and *Brasenia shreberi* (water-shield) are frequently present as monocultures in deeper littoral zones. A single population of the rare *Nymphaea tetragona var. liebergii* (pygmy waterlily) was historically known from Granite Lake and is believed to be extinct in Idaho. The listed threatened species *Howellia aquatilis* (water howellia) was historically known to occur near Spirit and Hoodoo Lakes and is believed to have been extirpated. Only one other population is known in Idaho near Harvard along the Palouse River; however, populations occur to the west in Spokane County, Washington. No other populations have been found to date in northern Idaho, even though high quality habitat exists.

Peatland Rare Plant Guild: Peatlands by definition are habitats whose soil substrate is composed of organic material; deposition of organic material exceeds decomposition. This guild can be divided into five distinct sub-guilds, each containing different communities and species, substrates, pH and abiotic processes. These five sub-guilds are Poor Fens, Intermediate/Rich Fens, Ombrotrophic Bogs, Paludified Forests and Shrub-carr (see descriptions below). Peatland habitats are predominantly found in the northern three sub-basins (Priest, Kootenai and Pend Oreille); however, several lowland fens are known for the lower Coeur d'Alene (Twin Lakes, Hauser Lakes, Rose Lake, Hidden and Thompson lakes). Several *Sphagnum*-dominated subalpine peatlands have been found on the divide between the Clearwater and the St. Joe sub-basins. Some small low elevation peatlands are known south of Clarkia. Peatlands are the oldest plant communities in northern Idaho and have changed little since the end of glaciation 6,000-7,000 years ago (Bursik and Moseley 1995; Moseley 1998). The rare species *Carex chordorrhiza* (string-root sedge), *Carex livida* (pale sedge), *Hypericum majus* (large Canadian St. John's wort), *Rhynchospora alba* (white beakrush), *Scheuchzeria palustris* (pod grass) and *Scirpus subterminalis* (water clubrush) have been documented for lowland fens in the Coeur d'Alene sub-basin. *Triantha occidentalis spp. brevistyla*, a species only known on the Priest Lake District on the Idaho Panhandle, has been reported for a subalpine fen complex on the St. Joe ; however, this sighting has not been verified. No survyes have occurred in the low elevation peatlands on the St. Joe .

Poor fens: Poor fens occur in glacial scours, kettle holes, isolated oxbows, old lake beds and at or near the heads of drainages where inflow is limited. Thick layers of *Sphagnum* peat have accumulated since the end of continental glaciation, about 6,000 - 7,000 years ago. These systems are minerotrophic,

receiving nutrients from water percolating through mineral soil or bedrock, and are quite acidic (pH values 4-6). These communities are characterized by a solid mat of *Sphagnum* moss and scattered stems of vascular plants. These communities are often erroneously referred to as 'bogs', especially when they occur on floating mats in seepage lakes.

Ombrotrophic bogs: These 'true bog' communities occur in glacial scours, kettle holes, isolated oxbows, old lake beds and at or near the heads of drainages where inflow is limited. Unlike poor fens, the thick mats of peat accumulate upwards forming hummocks, often at the base of shrubs or downed logs, and are above the influence of the water table. Incoming water and nutrients (from precipitation) are held above the water table, primarily by the low hydraulic conductivity of the *Sphagnum* peat. Vascular species are few or absent and are restricted to those tolerant of acidic conditions (poor fen species). The pH values are very acidic, ranging from pH 3- pH 4. Compared to rich fens (pH 6 - 7.5) the pH difference is equal to the difference between vinegar and salt water.

Intermediate and Rich Fens: Intermediate fens and rich fens are *Sphagnum*-poor peatlands with vascular plants contributing the majority of cover and composition. Laymen usually refer to these communities as marshes, wet meadows or swamps. The difference is that fen soils are organic, usually with little to no decomposition of organic material. True marshes have mineral soils, usually with high rates of decomposition. Intermediate fens have equal dominance by bryophytes (*Sphagnum* spp. and true mosses) and vascular plant species, especially sedges, while rich fens have few (if any) *Sphagnum* species present. Organic soils of rich fens are formed by accumulation of sedge, grass and brown moss peat (*Aulacomnium* and *Calliergon* species). *Carex utriculata* (beaked sedge), *Carex lasiocarpa* (slender sedge), *Carex aquatilis* (water sedge), *Scirpus microcarpus* (small- fruited bulrush), *Typha latifolia* (cattails)*, Calamagrostis canadensis* (bluejoint reedgrass)*, Spiraea douglasii* (hardhack), *Betula glandulosa,* (bog birch) and *Salix* spp. (willow)-dominated community types may occur as rich fens. Intermediate to rich fens in subalpine habitat are characterized by *Carex scopulorum* (Holm's mountain sedge), *Carex aquatilis* (water sedge), *Calamagrostis canadensis* (bluejoint reedgrass)*, Deschampsia cespitosa* (tufted hairgrass) and other species like *Kalmia microphylla* (bog laurel) and *Dodecatheon jeffreyi* (tall mountain shooting star). Rich fens are the most floristically diverse of the peatland types. Like poor fens, intermediate and rich fen communities can also occur on floating or fixed organic mats. Floating mats contain some of the most ecologically stable communities occurring in north Idaho peatlands because they adjust to fluctuating water levels annually, maintaining constant contact with water and never becoming inundated like fixed (shore) mats. The pH values for intermediate and rich fens can range between pH 6 - 7.5.

Paludified Forests: Paludified forests typically occur on the margins of closed peatland basins and often form a mosaic with poor fen, rich fen or shrub-carr communities. These communities are the result of expanding peatlands caused by a rise in the water table from peat accumulation. Paludification is thought to precede the formation of poor fen and true bog (ombrotrophic) habitats (Crum 1992). Paludified forests are characterized by an overstory of conifers, usually *Pinus contorta* (lodgepole pine) and *P. monticola* (white pine), with lesser amounts of *Abies bifolia* (subalpine fir), *A. grandis* (grand fir), *Picea engelmannii* (Engelmann spruce), *Thuja plicata* (western redcedar) or *Tsuga heterophylla* (western hemlock), with a soil that is *Sphagnum* peat. The understory is dominated by *Sphagnum* moss species and some vascular plants, including some rare species found in poor fens and ombrotrophic bogs. One species, *Maianthemum dilatatum* (false lily-of-the-valley) has been found in a single location in northern Idaho in a paludified forest.

Shrub-Carr: This sub-guild includes moist shrub land riparian communities. Shrub lands dominated by willows and other shrubs occur in nearly impenetrable patches along low gradient channels, as stringers or on narrow flood plains along high gradient streams, as mosaic patches within riparian forests, and on margins of meadows and fens communities. Most commonly, one or more shrubs dominate vast areas of moist to wet, seasonally flooded fens or riparian zones. Shrub-carrs often contain willow dominated shrub lands associated with low gradient meandering channels, or fens, and are dominated by *Salix drummondiana* (Drummond's willow), with lesser amounts or codominance by *Salix geyeriana* (Geyer's willow) and *S. sitchensis* (Sitka willow), and can contain *S. bebbiana* var. *bebbiana* (Bebb's willow), *Spiraea douglasii* (hardhack), *Alnus incana* (mountain alder), or *Betula glandulosa* (bog birch) community types. The rare willows *Salix candida* (hoary willow) and *Salix pedicellaris* (bog willow) can be found in shrub-carrs and in shrub/fen mosaics. *Betula pumila* (dwarf birch), a rare species in northern Idaho, can be found in shrub-carrs in the Moyie and Kootenai river systems. One rare lichen, *Cetraria sepincola* (bog-birch lichen), is found exclusively on the branches of bog and dwarf birches. Rare hybrids between *Betula pumila* (dwarf birch) and *Betula glandulosa* (bog birch) - known as *Betula X sargentii* - occur from the Priest River drainage (Johnson 1995). Willows are frequently absent or a minor component of shrub lands associated with higher gradient streams. *Alnus incana* (mountain alder), *Alnus sinuata* (Sitka alder), *Cornus sericea* (red-osier dogwood) and *Rhamnus alnifolia* (alder buckthorn) occur as community dominants along higher gradient streams. Patches of *Cornus sericea* (red-osier dogwood), *Salix bebbiana* var. *bebbiana* (Bebb's willow), *Crataegus douglasii* (Douglas hawthorn) and *Crataegus suksdorfii* (Suksdorf's hawthorn) are common in association with cottonwood forests on larger stream systems. *Crataegus columbiana* (Columbia hawthorn) is only found in warm,

Appendix 3: Non-native, invasive terrestrial plant species targeted for control measures on the Idaho Panhandle National Forests

SCIENTIFIC NAME	COMMON NAME
POTENTIAL INVADERS (CURRENTLY ABSENT)[1]	
ACHILLEA NOBILIS	NOBLE YARROW
ALLIARIA PETIOLATA	GARLIC MUSTARD
ANCHUSA ARVENSIS	SMALL BUGLOSS
BASSIA SCOPARIA	BURNING BUSH
BUTOMUS UMBELLATUS	FLOWERING RUSH
CAMPANULA RAPUNCULOIDES	CREEPING BELLFLOWER
CONVOLVULUS ARVENSIS	FIELD BINDWEED
EUPHORBIA MYRSIPNITES	MYRTLE SPURGE
NARDUS STRICTA	MATGRASS
POLYGONUM SACHALINENSE	GIANT KNOTWEED
SALVIA AETHIOPIS	MEDITERRANEAN SAGE
SOLANUM ROSTRATUM	BUFFALOBUR
SORGHUM HALEPENSE	JOHNSONGRASS
TAMARIX SP.	SALTCEDAR COMPLEX
TRIBULUS TERRESTRIS	PUNCTUREVINE
NEW INVADERS	
ACROPTILON REPENS	RUSSIAN KNAPWEED
ANCHUSA OFFICINALIS	COMMON BUGLOSS
ARCTIUM MINUS	COMMON BURDOCK
BARBAREA VULGARIS	GARDEN YELLOWROCKET
BERTEROA INCANA	HOARY ALYSSUM
CARAGANA ARBORESCENS	SIBERIAN PEA SHRUB
CARDARIA DRABA	HOARY CRESS, WHITETOP
CARDUS NUTANS	MUSK THISTLE
CENTAUREA DIFFUSA	DIFFUSE KNAPWEED
CENTAUREA SOLSTITALIS	YELLOW STARTHISTLE
CHAENORHINUM MINUS	DWARF SNAPDRAGON
CHONDRILLA JUNCEA	RUSH SKELETONWEED
CRUPINA VULGARIS	COMMON CRUPINA
CYTISUS SCOPARIUS	SCOTCH BROOM
DIGITALIS PURPUREA L.	FOXGLOVE
ECHIUM VULGARE	BLUEWEED, TEXAS BLUEWEED
ELAEAGNUS ANGUSTIFOLIA	RUSSIAN OLIVE
EUPHORBIA ESULA	LEAFY SPURGE

FALLOPIA X. BOHEMICA, F. JAPONICA (PREV. POLYGONUM CUSPIDATUM, P. JAPONICA)	BOHEMIAN OR JAPANESE KNOTWEED
HYPOCHAERIS RADICATA	SPOTTED CAT'S EAR
IRIS PSEUDACORUS	YELLOW-FLAG IRIS
ISATIS TINCTORIA	DYER'S WOAD
JACOBAEA VULGARIS (PREV. SENECIO JACOBAEA)	TANSY RAGWORT
KNAUTIA ARVENSIS	FIELD SCABIOUS
KOCHIA SCOPARIA	KOCHIA
LEPIDIUM DRABA (PREV. CARDARIA DRABA)	HOARY CRESS, WHITETOP
LEPIDIUM LATIFOLIUM	PERENNIAL PEPPERWEED
LYTHRUM SALICARIA	PURPLE LOOSESTRIFE
MYRIOPHYLLUM SPICATUM	EURASIAN WATERMILFOIL
ONOPORDUM ACANTHIUM	SCOTCH THISTLE
POTENTILLA ARGENTEA	SILVERY CINQUEFOIL
RANUNCULUS ACRIS	TALL BUTTERCUP
SOLANUM DULCAMARA	CLIMBING NIGHTSHADE
SOLANUM ELAEAGNIFOLIUM	SILVERLEAF NIGHTSHADE
TRIFOLIUM ARVENSE	HARE'S FOOT CLOVER
TRIPLEUROSPERMUM MARITIME	SCENTLESS CHAMOMILE
WIDESPREAD WEEDS[3]	
ARTEMISIA ABSINTHIUM	ABSINTH WORMWOOD
BROMUS TECTORUM	CHEATGRASS
CENTAUREA DEBEAUXII (PREV. C. NIGRESCENS)	MEADOW KNAPWEED
CENTAUREA STOEBE	SPOTTED KNAPWEED
CICHORIUM INTYBUS	CHICORY
CIRSIUM ARVENSE	CANADA THISTLE
CIRSIUM VULGARE	BULL THISTLE
CONIUM MACULATUM	POISON HEMLOCK
CYNOGLOSSUM OFFICINALE	HOUNDSTONGUE
HIERACIUM AURANTIACUM	ORANGE HAWKWEED
HIERACIUM CAESPITOSUM	MEADOW/YELLOW HAWKWEED COMPLEX
HYPERCIUM PERFORATUM	ST. JOHNSWORT
LATHYRUS LATIFOLIUS	PERENNIAL PEA
LEUCANTHEMUM VULGARE	OXEYE DAISY
LINARIA DALMATICA	DALMATIAN TOADFLAX
LINARIA VULGARIS	YELLOW TOADFLAX
MATRICARIA DISCOIDEA	PINEAPPLE WEED
MELILOTUS OFFICINALIS	WHITE AND YELLOW SWEET CLOVER

PHALARIS ARUNDINACEA	REED CANARY GRASS
POTENTILLA RECTA	SULFUR CINQUEFOIL
SISYMBRIUM ALTISSIMUM	TUMBLE MUSTARD
SONCHUS ARVENSIS	PERENNIAL SOWTHISTLE
TANACETUM VULGARE	COMMON TANSY
VERBASCUM THAPSUS	MULLEIN
VERONICA CHAMAEDRYS	GERMANDER SPEEDWELL
VERONICA OFFICINALIS	COMMON SPEEDWELL

1. Potential invaders: Goal is to prevent and eradicate promptly if found
2. New invaders: Goal is to eradicate small new infestations and reduce larger infestations
3. Widespread weeds: Goal is to contain inside infested area and reduce plant populations

Appendix 4. Documented sensitive plant and FSOC occurrences and associated design features

# occurrence	Units	Proposed Rx/ logging system	Species	Species status	Plant location details	Design features/ comments
1	29b_5	Clearcut with reserves/ Skyline	*Botrychium minganense* (Mingan moonwort)	Region 1 sensitive species	One Mingan moonwort occurrence ~150' from NW boundary of Unit 29b_5 & 235' from FS Rd. 1235	Buffer and flag for visibility and avoidance. No concerns: occurrence is far from proposed activities
2	29b_5	Clearcut with reserves/ Skyline	*Platanthera orbiculata* (Round-leaved orchid)	Forest species of concern (FSOC)	One Round-leaved orchid occurrence located in corner of Unit 29b_5	A few individual plants would be directly affected by the Proposed Action
3	08b_2, 09a, 11a	Seed tree with reserves/ skyline (08b_2), Seed tree with reserves/ ground-based (09a), Clearcut with reserves/ skyline (11a)			Extensive Round-leaved orchid occurrence in northern end of project area (Kelley & Theriault Creeks, Roundhouse Gulch). There would be no direct effects to the majority of plants, as they are either far from the proposed activities (~350–1000'). A small part of this occurrence is located ~25–50' from unit boundaries. A few individual plants are located within units and would be directly impacted by the proposed activities.	Monitoring of select portions of this occurrence is proposed for plants in untreated and treated areas (see report section discussing direct and indirect effects of the Proposed Action)
4	19c, 34a	Irregular shelterwood with reserves/ off-road skyline (19c); Clearcut with reserves/ ground-based (34a)	*Platanthera orbiculata* (Round-leaved orchid)	FSOC	Round-leaved orchid occurrence made up of a few isolated plants located ~75' from Unit 19c and a few individuals within 34a.	No concerns regarding plants near 19c. Orchid plants located within Unit 34a would be directly impacted by the Proposed Action
5	06b	Seed tree with reserves/ ground-based	*Dodecatheon dentatum* (White-flowered shooting star)	FSOC	White-flowered shooting star occurrence located over 300' from NE boundary of Unit 06b & within protected RHCA	No concerns: occurrence is far from proposed activities.

Appendix 5: Description of moist forest habitat associates

	Species Name	Geographic distribution	G/T-rank/ S-rank*	Associated habitat guild	Notes regarding habitat requirements, population ecology, threats	Can disturbance be beneficial?
1	***Asplenium trichomanes*** **(Maidenhair spleenwort)**	Interruptedly circumboreal	G5/ S1	Microhabitat: rock seeps in moist/ wet forests	Maidenhair spleenwort occurs in moist, rocky, cliff crevices and talus slopes; prefers calcareous rock (Lorain 1989). Threats: "Timber harvest and other habitat-altering activities such as road building and rock quarries pose the most significant threat to maidenhair spleenwort" (Lorain 1989: 4)	No – see notes regarding habitat alteration
2	***Blechnum spicant*** **(Deer fern)**	Circumpolar, coastal disjunct	G5/ S3	Moist/ wet forest	Associated with both early successional and old growth/ climax moist and wet forests (western hemlock, Sitka spruce, western redcedar, Douglas-fir, and Pacific silver fir forests). Appears after disturbances such as windfall, logging. Cover/ distribution changes with changes in stand composition and age (e.g., cover increases in climax stages) (Mathews 1993)	Yes – associated with various successional stages
3	***B. lanceolatum*** **var. *lanceolatum* (Lanceleaf moonwort)**	Circumboreal	G5T4/ S3	Moist/ wet forest	"With the exception of *B. montanum*… moonworts tend to occur in areas of disturbance that are from 10 to 30 years old. This includes old roads and roadsides, picnic and camping grounds, pastured meadows, avalanche meadows, etc. We seldom find moonworts in abundance under mature old growth forests without recent disturbance." (Ahlenslager and Potash 2007: 34) Moonworts "tend to occur in areas where some mineral soil is exposed or has been exposed within the last 10-30 years. This probably has to do with the ability of arriving spores to percolate into the soil and perhaps also with the establishment and ecology of the appropriate mycorrhizal fungi." (Ahlenslager and Potash 2007: 34) "The recently or periodically disturbed sites that support moonworts have several characteristics in common. They support vegetation that is in an early stage of succession. … They have a generous surface exposure of mineral soil (20% or more). They often have a compacted soil." (Ahlenslager and Potash 2007: 34)	Yes – 10-30 year disturbance cycle and evidence of persistence/ presence in compacted soils.
4	***B. lineare*** **(Slender moonwort)**	Circumboreal	G1/ SH	Moist forest		
5	***B. minganense*** **(Mingan moonwort)**	Circumboreal	G4/ S3	Moist/ wet forest		
6	***B. paradoxocum*** **(Paradox moonwort)**	Circumboreal	G2/ S1	Moist/ wet forest		
7	***B. pinnatum*** **(Northern moonwort)**	Circumboreal	G5/ S2	Moist/ wet forest		
8	***B. simplex*** **(Least moonwort)**	Circumboreal	G5/ S2	Moist/ wet forest		
9	***Buxbaumia viridis*** **(Green bug-on-a-stick)**	Interruptedly circumboreal	G4/ S2	Moist/ wet forest	Rotten stumps/ logs; mineral or organic soil. Cool, shaded humid locations at middle elevations. Closed canopy provides necessary microclimate for species occurring on decaying wood and humic duff. "Shelterwood and thinning prescriptions for timber harvest may impact populations, as logs dry out under the changing microclimate regime" (USDI 1996: 5). BUVI requires "continued input of coarse woody debris in various decay classes and diameters as a substrate" (USDI 1996: 5). "Maintain decay class 3, 4, and 5 logs, leaving windfalls in place to provide structurally diverse habitat and maintain a dense overstory to maintain humidity (< 70% closed canopy)" (USDI 1996: 2).	No – see notes
10	***Cardamine constancei*** **(Constance's bittercress)**	Endemic to northern Idaho	G3/ S3	Moist/ wet forest and deciduous riparian habitat	Micro-sites appear to be important in protecting relict populations (in 70-100 year-old stands). "From these relict populations the species may expand as forest succession proceeds." (Lichthardt and Moseley 1994) Changes to canopy cover has variable results: although increased light stimulates flowering and perhaps production of ramets, direct sun following canopy removal causes mortality to plants. Limited genetic variability at intra-population level (due to predominant clonal propagation and small, reproductively-isolated populations)	Possibly – see notes
11	***Cypripedium fasciculatum*** **(Clustered lady's slipper)**	Sparsely distributed within broad range spanning mountainous areas of eight western states	G4/ S3	Moist/ wet/ dry forest	General habitat conditions: in northern Rocky Mountains, this species is associated with coniferous forest or inclusions within coniferous forests. Some degree of shade required, although this may range from deep or partial shade to dappled sunlight. See Brown (2008) for a discussion of the potential significance of different types of shade created by conifers, drier site shrubs, and broader-leaved shrubs associated with moister-habitat conditions, such as Pacific dogwood, for Sierra Nevada occurrences of *Cypripedium fasciculatum*. Soil conditions: Lichthardt (2003: 8-9) observes that while CYFA may be a habitat generalist, as with all orchids, it requires the presence of an organically-enriched O horizon with healthy mycorrhizal networks (i.e., its roots are colonized by hyphae of symbiotic soil fungi). It is typically associated with forest floors with layers of litter and duff. Because of its reliance on mycorrhizae, CYFA is very vulnerable to, and unlikely to survive, direct soil disturbance.	No – occurrences typically associated with mid- or, more frequently, late-seral stands. See Lichthardt's (2003: 7) discussion of important light and soil elements of late-seral stands.

					Habitat: in northern Idaho and western Montana, "[f]orest structure and composition have largely resulted from past fires (Lichthardt 2003: 6). Associated habitat types in northern Idaho (western Montana) include both dry and moist forest (Lichthardt 2003: 7, 9). Dry forest sites are characterized by Douglas-fir/ ninebark and grand fir/ ninebark habitat and shorter disturbance cycles: 10-30 year cycles of fire. In the case of CYFA associated with dry forest habitat, Lichthardt (2003: 9) observes that the more densely stocked forests and greater canopy cover associated with the past 50 years of fire suppression may negatively impact suitable habitat by increasing the chances of a stand-replacing fire. Moist forest habitats typified by Western redcedar (and including western hemlock and grand fir) historically experienced longer disturbance intervals: 75-100 year underburn cycles and 150->200 year cycles for stand-replacing fires. Lichthardt (2003: 17) suggests that increasing stand age and development may contribute to the development of habitat for CYFA and, citing Harrod (personal communication), further suggests that CYFA "may be thriving in some areas under conditions of fire suppression. As stands age, they become patchy and multilayered, allowing more light to the forest floor and building up deeper duff layers and rotted wood that provide a medium for a rich fungal network." Moist forest habitat CYFA occurrences in this region are either mid-seral, or, more frequently, late-seral (Lichthardt 2003: 7) Fire: The direct impacts of fire to existing individual plants will vary depending on fire intensity. Specifically, if the fire temperature is moderate and the duff layer is left somewhat intact, the underground portion of the plant may survive; more intense fires will kill existing plants.	
12	***Grimmia brittoniae* (Britton's grimmia moss)**	Narrow endemic – western Montana and northern Idaho	G2/ S2	Microhabitat: (calcareous) rock cliffs in moist forest	Threats for one Montana population include road widening, which may affect cliff face upon which moss grows (MNHP 2017)	No – narrow microhabitat adaptation
13	***Mimulus alsinoides* (Chickweed monkeyflower)**	British Columbia south to Idaho and northern California	G5/ S1	Microhabitat: rock cliffs, seeps in wet/ moist/ dry forest habitat	Vernally moist rocky cliffs (Klinkenberg 2017)	No – given microhabitat adaptation; however, more data necessary
14	***Rhizomnium nudum* (Naked mnium moss)**	Amphi-beringian distribution.	G4/ S1	Moist/ wet forest	Moist, coniferous forests. Associated with mature, stable stands (i.e., lacking disturbance); riparian areas (low gradient) (Harpel and Holmberg 2005) Narrow environmental specificity: moist, but not wet, substrates; can be along streams or by persistent snowpack	No – see notes
15	***Waldsteinia idahoensis* (Idaho barren strawberry)**	Narrow endemic	G3/ S3	Moist/ wet forest	Habitat includes moist grand fir forests under closed canopy and in forest openings. Canopy opening may increase reproduction in the short-term; low-intensity fire will not affect the species (Crawford 1980).	Possibly – more data necessary

Appendix 6: FSOCs documented in project area

#	Species Name	Geographic distribution	G/T-rank/ S-rank*	Associated habitat guild	Notes regarding habitat requirements, population ecology, threats	Can disturbance be beneficial?
1	***Plantanthera orbiculata* (Round-leaved orchid)**	Wide range in North America; rare throughout a large portion of this range, particularly to the south.	G5/ S3	Moist/ wet forest	Range of distribution: Idaho is one of the southernmost states where this species is documented and it is considered vulnerable in this state. Habitat: although the Round-leaved orchid is a habitat generalist (found in various forested or wetland habitats), it has key requirements, which are frequently scarce. As is the case with other orchids, round-leaved orchid 1) tends to occur in small populations, which contributes to its vulnerability; 2) requires mycorrhizal fungal associates in the soil; 3) has long dormancy period; and 4) is dependent on pollinators. This species is most often associated with late successional forests. It is usually found in damp, rich humus in deeply shaded forested areas. It has been documented as occurring in mossy areas of deep litter and with abundant coarse, woody debris (Washington and the Black Hills), where soil moisture is high (Hornbeck et al. 2003: 5) Fire: in the Black Hills, Hornbeck et al. (2003: 6) suggest that, historically, fire played a role in maintaining Round-leaved orchid habitat (which in that area, comprises mainly of birch forests that would be replaced by spruce in the case of fire suppression. From Hornbeck et al. (2003: 6), "Fires may enhance soil moisture availability within orchid sites where the fire misses the species' sheltered microsites, but removes conifers from surrounding uplands, thereby increasing groundwater flow. However, fire affects successional dynamics and can impact large round-leaved orchid's habitat by returning it to an earlier seral stage. Fire may also impact the orchid's species associates (Lesher and Henderson 1998)." Vegetation management: "any changes to the immediately surrounding macrohabitat could negatively affect the species by reducing shade, and thereby, snow and moisture retention. Immediately surrounding habitat conditions may positively or negatively influence the orchid's microhabitats and any disturbance that results in shade reduction at known sites is also a potential risk." (Hornbeck et al. 2003: 8)	No – except fire.
2	***Dodecatheon dentatum* (White-flowered shooting star)**	Infrequent in sc BC (Manning P.P. east to the Okanagan Valley); south to OR, ID	G4/ S3	Wet forest	No relevant data found for this species. No conservation status assessment by NatureServe as of September 7, 2018	No data for this species, but wet forest habitat makes it unlikely that disturbance is beneficial.

Appendix 7. Past, present, and reasonably foreseeable actions.

Action	Past	Present	Reasonably foreseeable	Level of cumulative effects	Comments
Timber harvest on private land	X			**NA**	It is not possible to quantify the effects of timber harvest on private lands to sensitive plants on nearby or adjacent National Forest lands. Where botanical inventories are lacking, it is not possible to know about the species or habitat present or about the distribution, numbers, or status of rare plants. Additionally, it is not possible to say definitively that any potential impacts to rare plants and/ or their habitat on private lands have affected or would affect rare plants in the proposed project area. As a result, timber harvest on private lands is not considered to have a cumulative effect on rare plants or habitat within the proposed project area.
Timber harvest on National Forest lands	X		X	**Low to moderate**	Timber harvest affects canopy coverage and causes soil disturbance; however, its potential impacts can vary depending on the silvicultural prescription and methods used. Silvicultural practices such as thinning or harvest mechanisms such as skyline, helicopter yarding, or operations on snow or frozen soils would result in **low** cumulative effects on rare plants—as direct impacts may be less likely and/ or less intense (e.g., trampling plants, rutting soil, soil compaction), but indirect impacts to habitat still occur (canopy cover decreases). Silvicultural activities such as regeneration harvest or harvest mechanisms such as ground-based yarding can result in **moderate** cumulative effects to rare plants (see the Brebner Flat EA and Soils Report for more details). When a combination of silvicultural prescriptions and yarding methods are used, such activities may be considered to result in a range of **low to moderate cumulative effects** to rare plants. In the case of **low** impacts, individuals, populations, and habitat are likely not affected; in the case of **moderate** impacts, although individuals and/ or habitat may be affected, no entire population would be affected, nor would the long-term capability of the habitat to support rare plants.
FS prescribed burning for site preparation & fuels treatment	X		X	**Low to moderate**	Prescribed burning effects changes in canopy cover and soil/ ground disturbance. Direct soil disturbance within the proposed activity area resulting from fireline construction is possible. Where burning is more intense (e.g., because of heavier ground fuels), plants may be either directly consumed by fire or indirectly affected by changes to canopy cover or soils (e.g., removal of litter/ duff layer). Such activities would likely result in **low to moderate** cumulative effects on rare plants.
Tree planting	X	X	X	**Very low**	Tree planting causes soil disturbance and may affect individual, undetected, rare plant occurrences (documented occurrences would be protected by spatial buffers).

					However, the scale of any such impact would be very small and would result in a **very low cumulative effect** to rare plants (i.e., no measurable effect).
Road construction and road decommissioning	X	X	X	**Low to moderate**	Past road construction in the project area has likely affected rare plants and their habitat due to the soil disturbance and removal of canopy cover associated with this activity. Additionally, the machinery used in road construction, and the vehicles driven subsequently, have resulted in the introduction of non-native, invasive plant species (weeds), which have further altered the habitat in these areas. Consequently, these activities are considered to have a **low to moderate cumulative effect** on rare plants.
Road maintenance and storage	X	X	X	**Low**	The potential effects of road maintenance and storage are similar to those for road construction and decommissioning, except that the scale of disturbance is much smaller and no new area is being disturbed. Consequently, these activities have a **low cumulative effect** to rare plants.
Fire suppression	X		UNK**	**Low**	Some activities associated with fire suppression could impact rare plants as a result of direct injury/ mortality or soil disturbance (e.g., fireline construction, back-burning). Such impacts would have a **low cumulative effect** to rare plants.
Pre-commercial timber stand improvement	X		X	**Very low**	Pre-commercial timber stand improvement entails pruning and thinning young trees prior to canopy closure. As a result of these activities, the time it takes for stands to reach canopy closure (which provides critical shade for some moist forest rare plant species) increases. Because the magnitude of change to canopy cover is so slight and the effects do not last long (less than 10 years), the **cumulative effects to rare plants are considered very low**.
Trail construction and maintenance	X		X	**Low and very low**	Trail construction results in soil disturbance, but because the scale of the activity is so limited, effects would be restricted to individual rare plants or small sub-populations. Consequently, the **cumulative effects to rare plants would be low**. Trail maintenance involves even more restricted scale of disturbance, such that the **cumulative impacts would be very low**.
Weed treatment	X	X	X	**Low**	Ongoing weed treatments (specifically, herbicide treatment) Ongoing chemical weed treatments on the St. Joe RD focus on roadside weeds. Herbicides can damage or kill plants other than the target weeds and can linger in soil for variable periods of time, although the spatial scale of potential impacts are localized. For the most part, rare plants are not associated with disturbed habitats like roads; exceptions include a few disturbance-tolerant species like Howell's gumweed and several of the Moonwort species. In the case of the Moonworts, certain species are often found along older road prisms (*Botrychium lanceolatum* ssp. *viride* and *B. pinnatum*). As a consequence, these species would be at greater risk of effects from weed treatments. However, because few rare plant species occur in

					treatment areas and because the spatial scale of impacts is restricted, the overall **cumulative effects to rare plants would be low**.
Wildfires	X		UNK	**Low to high**	Wildfires can result in changes to canopy cover and soil disturbance. Past fire suppression increases the likelihood of more intense wildfires in the future, resulting in more intense soil disturbance and changes to canopy cover. Consequently, **cumulative effects to rare plants from wildfires can range from low to high**.
Public activities like cutting firewood, driving roads, camping, snowmobiling, hunting, hiking, picking berries	X	X	X	**Very low to low**	Small-scale soil disturbance and removal of forest canopy may result from public activities like cutting and skidding firewood and vehicle use. Trampling and/ or picking of flowers may also occur. Overall, the scale of these activities is very small, such that potential effects would have very low to low cumulative effects on rare plants.